

Controlled growth of opal and inverse opal films

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A new capillary-assisted deposition method for the preparation of three dimensional opal films and opal heterostructures as well as inverse opal films has been developed. By this new method, the film thickness, the crack arrangement and distribution in the opal films can be easily controlled. Alternatingly structured lateral opal heterostructures consisting of different spheres has also been derived from this method. A special set-up, which combines a capillary tube and a capillary cell, has been exploited to utilize capillarity and to fulfill the above achievements. The capillary tube transports the suspension from a container to the capillary cell, while the capillary cell helps to assemble the spheres, forming the three dimensional colloidal crystals. The set-up defines the drying fronts, and thereby thickness and crack arrangements of the opal films. The two-capillary set-up is also useful for the infiltration of opal films with a titania precursor. After calcination, inverse titania opal films with the skeleton structure have been obtained.